IN THE SPECIFICATION:

Please replace the paragraph beginning on page 1, line 13 in the specification with the following:

—Good estimates of the tape pack radii are fundamentally important in controlling all aspects of the system operations. For example, good estimates are important in determining from which reel to draw the tape to wrap around a scanner. An inaccurate estimate could result in an over-rotation of the selected reel. Further, good estimates are important to determining when to decelerate a high-speed rewind operation, again to avoid over-rotation of one of the reels that may result in the breaking of the tape ~~of~~ or the ~~detatchment~~ detachment of the tape from the reel. Also, good estimates are important to determine if there is sufficient tape available on the supply reel to complete a record operation. Inaccurate estimates of the reel pack radii can result in incomplete record operations, if the system sufficiently under estimates the tape position. —

Please replace the paragraph on page 4, line 21 in the specification with the following:

—Figs. 2A and 2B ~~is~~ are a flowchart of the operations of the system of Fig. 1; and—

Please replace the paragraph beginning on page 5, line 23 in the specification with the following:

—The tape system includes other well-known elements such as additional tape guides, scanners, longitudinal heads, and so forth, none of which are shown in the drawing. As long as these elements are fixed in position so that they do not cause the tape path to vary, their presence is immaterial to the operations of the Kalman filters 26a and 26b. The effects on the operations of the filters of a change in the tape path length, for example, by means of movable guides, is discussed below with reference to Fig. ~~4~~ 3. —

Please replace the paragraph beginning on page 9, line 4 in the specification with the following:

— The desired predictive equation is the integral of eqn. 4, from an initial time t_0 to the time t_f for which the prediction is required:

$$r(t_f) - r(t_0) = \frac{\delta}{2\pi}\left[\theta_r\left(t_f\right) - \theta_r(t_0)\right]$$

where $r(t_i)$ is the tape pack radius at time t_i, and $\theta_r(t_i)$ is the angular position of the take-up reel at time t_i. Thus:

$$r(t_f) = r(t_0) + \frac{\delta}{2\pi}\left[\theta_r(t_n) - \theta_r(t_0)\right] \qquad \text{eqn. 5}$$

Inaccuracies in this model are accounted for in the Kalman filter by an estimate of "noise" applied to the system - that is, by quantifying as applied noise essentially un-measurable attributes of the system dynamics. The applied noise is one of the factors that is used in determining the Kalman filter gain, k, as discussed below with reference to Figs. 2A, 2B and 3. —

Please replace the paragraph beginning on page 10, line 19 in the specification with the following:

—The system ignores measurements that it determines to be unreasonable. As discussed below with reference to Figs. ~~3~~2A and 2B, the system considers a measurement to be unreasonable if the associated measurement error variance, σ_m^2, is greater than the maximum variance σ_{max}^2, or if the three-sigma measurement interval around the calculated measured radius r_m, as determined by the measurement model, is not at least partially included within the interval from the minimum tape pack radius, r_{min}, to the maximum tape pack radius, r_{max}. Ignoring the unreasonable measurements greatly improves the robustness of the Kalman filter to capstan slip. —

Please replace the paragraph beginning on page 11, line 11 in the specification with the following:

—Referring now to Figs. 1, 2A and 2B, when a tape, for example, a cassette tape, that is wound on the supply and take-up reels 10 and 16, is loaded into the system, the system has no indication of the tape pack radii. Accordingly, the tape pack radii processor 26 in step 300 must initialize the Kalman filter with (1) an initial tape pack radius estimate, (2) an initial estimation error variance and (3) initial position measurements of the capstan, the tension arm, and the reel, that is, θ_c, θ_a and θ_r, where θ_r is the angular position of the tape reel under consideration, for example, the take-up reel. We discuss below the operations of the system in determining the tape pack radius of the take-up reel 16. The system performs the same operations to produce estimates of the tape pack radius of the supply reel 10 and the associated estimation error variance. —

Please replace the paragraph beginning on page 13, line 13 in the specification with the following:

—If the measurements are reasonable, the processor, in step 318, calculates the Kalman filter gain, k, as:

$$k = \frac{v^-}{v^- + {\sigma_m}^2}$$

where v^- is the estimation error variance extrapolated from the previous sample time. The processor next, in step 320, updates the estimate of the tape pack radius as:

$$\hat{r}^+ = \hat{r}^- + k(r_m - \hat{r}^-)$$

and updates the estimation error variance as:

$$\cancel{v^+ = \frac{1-k}{v^-}} \qquad v^+ = (1-k)v^- . \text{ —}$$

Please replace the paragraph beginning on page 15, line 12 in the specification with the following:

—Referring now to Fig. ~~4~~ 3, at step 400 the processor operates in a "coasting" mode when the tape path length is altered by anything but the tension arm. For example, the system operates in the coasting mode when the tape is being unwound from one reel and wrapped around the scanner (not shown). The system also operates in a coasting mode when the tape is being withdrawn from the scanner. These operations, which significantly change the length of the tape path, are not included in the underlying assumptions upon which the measurement model in the Kalman filter is based. Accordingly, the measured radius r_m produced by that model cannot be used to determine the estimates of the tape pack radius and the error variance when the path length is so altered. The estimates are instead produced using the predictive model. —

Please replace the paragraph beginning on page 16, line 1 in the specification with the following:

—The system thus extrapolates from the current estimates of tape pack radius and estimation error variance to the next sample time by taking a next set of position measurements ~~(step 402)~~, determining $\Delta\theta_c$, $\Delta\theta_a$ and $\Delta\theta_r$ ~~(step 404)~~ and estimating the tape pack radius by:

$$\hat{r}^- = \hat{r}^+ + \frac{\delta}{2\pi}\Delta\theta_r$$

and the error variance by

$$v^- = v^+ + \sigma_v^{\ 2}$$

where $\sigma_v^{\ 2}$ is a constant that represents the inaccuracies in the predictive model (step ~~406~~402). ~~It next~~Next, in step ~~408~~404, the system sets θ_{c-}, θ_{a-} and θ_{r-} equal to the measured values and $\hat{r}^+ = \hat{r}^-$ and $v^+ = v^-$, and at the next sample time again begins the process of predicting the estimates. The system ~~thus~~ then returns to step ~~402~~400. —

Please replace the paragraph beginning on page 16, line 12 in the specification with the following:

—The processor continues operating in the coasting mode while the system is varying the tape path length. Once the tape path length is held constant, the processor again utilizes the filter gain, and operates as discussed above with reference to Figs. ~~3~~2A and 2B. —

Please replace the paragraph beginning on page 16, line 20 in the specification with the following:

— While the measurement model could be revised to include the system operations in which the path length is varied, it is not necessary since ~~the time~~ the system spends so little time performing these operations. Thus, the trade off of increased complexity in the model for more accuracy during these limited path-varying operations seems unwarranted. Further, since the estimates produced by the Kalman filter converge rapidly, the accuracy of the system is only minimally reduced by not including in the model the path-varying operations. —